Alternative Insitu software

SCF 9C03_1 DST-SolTerm

vAConsult

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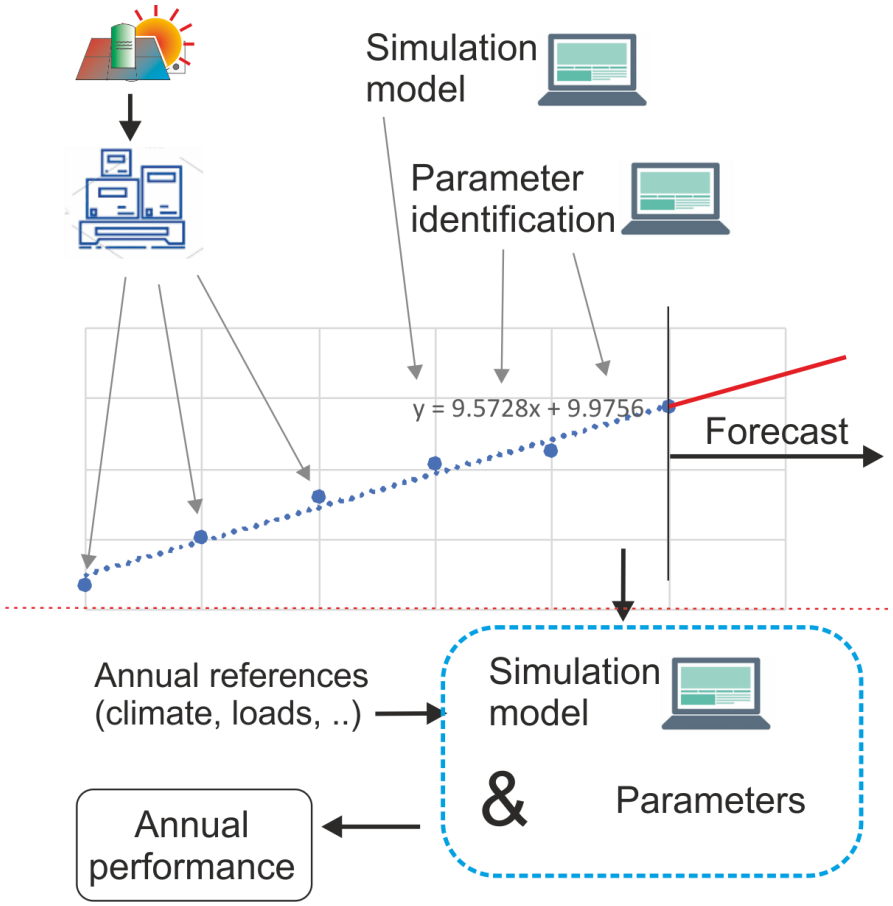
Introduction

- Dynamic System Test (=DST)
  - System test for SDHW systems
    - EN 12976-2 and ISO 9459-5
- Two pieces of software needed:
  - Supplied only by ‘InSitu software’
    - Fit program
    - Simulation model
  - Software not maintained anymore
- Project aim:
  - Find an alternative through Soltherm model
  - vAConsult & IGTE (ITW)



Specifics on DST method

- Method described in standards:
  - ISO-9459-5: how to test
  - EN 12976-2: conditions (ref.'s)
- Test result is:
  - Fitted parameters for Insitu model
    - Insitu model is a specific simplified model
    - Developed for msDOS (fast coded)

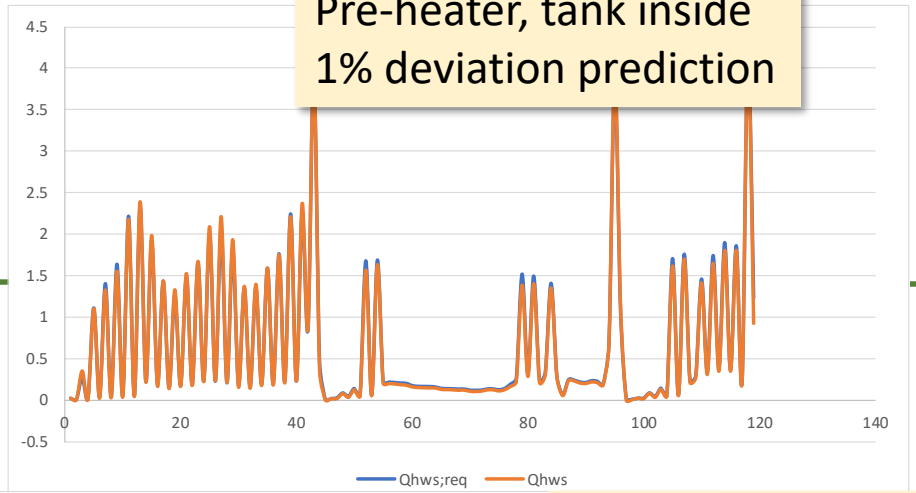
Transition to new simulation model starts with fitting measurements to new model

- Working with new model:
  - Use existing measurements
  - Apply new fit program and simulation model
  - Gives fitted parameters for new simulation model
  - Base for annual performance calculations
- The new model is the SolTherm simulation model
  - Acceptable for EN 12977-2 (SN decision)
  - EPBD based
- The fit program is Excel 'Solver'
  - Freely accessible

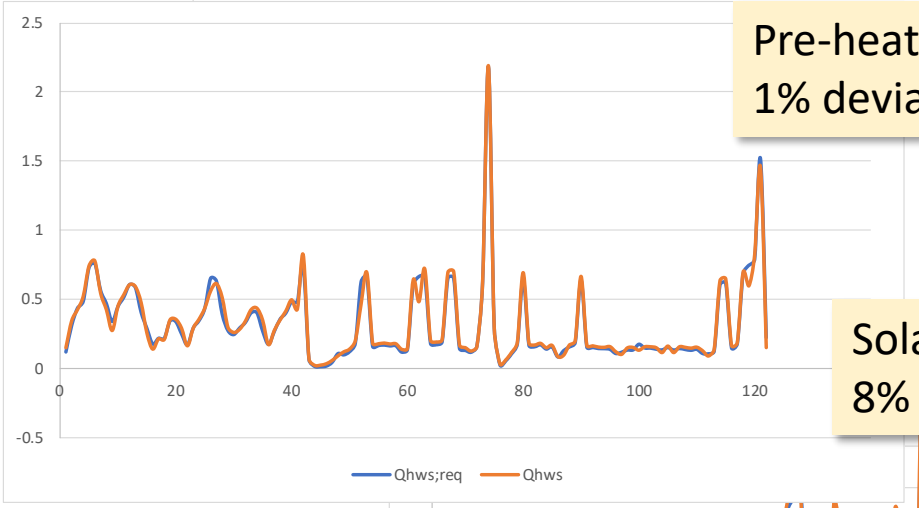
First results: promising

- First trial runs with existing DST measurements
  - Combi Soltherm & Solver is working
- Limited to <u>hourly</u> data:
  - Pre-heaters show good results
  - Solar Plus supplementary need some work.

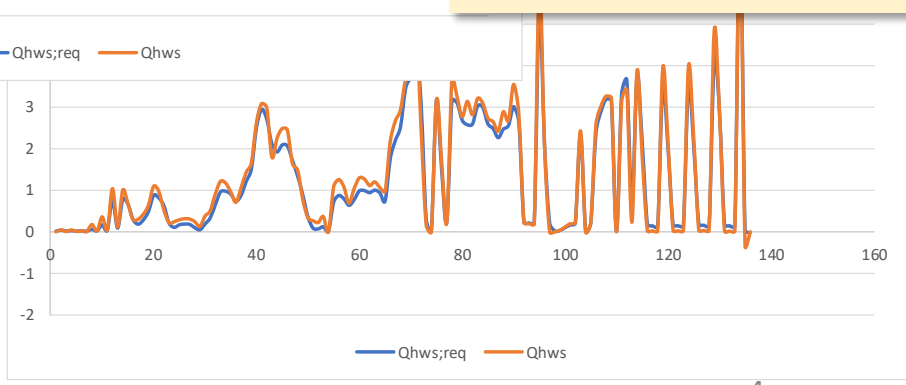
Pre-heater, tank inside
1% deviation prediction



Pre-heater, tank outside
1% deviation prediction



Solar & supplementary
8% deviation prediction



Next steps

- Issues with the SolTherm model
  - Model developed for heat demand and not volume demand
    - Added to the model
  - Model developed for hourly time step
    - Revision to smaller timestep in progress

- Future work
  - Test for solar plus with smaller timestep
  - Involve IGTE for more datasets
  - Test for annual performance prediction

PARAMETER IDENTIFICATION SHEET

Trial for alternative of Spurkl DST software

Identified values

	Min	≤	Value	≤	Max	Unit	Include:	
Acol;tot =	2	≤	2.73	≤	5	m2	Yes	*Total collector area*
a1 =	3	≤	5.792	≤	6	W/(K.m2)	Yes	*First order collector heatloss coefficient*
Hsol_loop =	1.5	≤	3.802	≤	5	W/K	Yes	*Heatlosses collector loop piping*
Vsto =	100	≤	235.7	≤	350	Ltr	Yes	*Total storage volume*
Hsto =	0.8	≤	2.27	≤	3	W/K	Yes	*Tank heatloss rate*
Csto =	0.2	≤	0.5	≤	10	W/(m.K)	No	*effective vertical heat conductivity*
InletPosition_Col	0.4	≤	0.4773866	≤	0.6	-	Yes	*Tank inlet position from collector loop*
OutletPosition_Col	0	≤	0	≤	0.2	-	No	*Tank outlet position from collector loop*
Hexch_Col	50	≤	330.2	≤	500	W/K	Yes	*Collector heat exchanger heat transfer rate*
Inletposition_WHS	0	≤	0.000165	≤	0.3	-	Yes	*Tank inlet position from water heating loop*
OutletPosition_WHS	0.6	≤	0.8454607	≤	1	-	Yes	*Tank outlet position from water heating loop*
Hexch_WHS	0	≤	0	≤	3000	W/K	No	*Water heating heat exchanger heat transfer rate*
InletPosition_Buh	0.81	≤	0.9668162	≤	1	-	No	*Tank inlet position from Backup heater loop*
OutletPosition_Buh	0.3	≤	0.3014618	≤	0.8	-	No	*Tank outlet position from Backup heater loop*
Hexch_Buh	0	≤	31243.298	≤	50000	W/K	No	*Backup heater heat exchanger heat transfer rate*

Measured values				**Fixed values**		
	Value				Value	
System type:	SPS			a2	0	W/(K2.m2)
SolLoc	HS	Loop location		IAM	1	-
StoLoc	HS	Tank location		MCol	0.02	kg/s
TnkHeight	1800	mm		Eo=	1.00	-
Hexch_ColFlg	Yes	Yes/No		Tsto_init	15	oC
Hexch_WHSFlg	No	Yes/No				
Hexch_BuhFlg	Yes	Yes/No				

Run the solver

Proforma sum: 31826.89 Needed for Objective argument

Objective: 0.3052 Argument needed to force call after recalc

Solver cannot improve the current solution. All constraints are satisfied.

Qhws;req = -79.6 kWh

Qhws = -78.8 kWh